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The Implications of Marijuana Legalization on the Prevalence and Severity of Schizophrenia

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THE IMPLICATIONS OF MARIJUANA LEGALIZATION ON THE PREVALENCE AND SEVERITY OF SCHIZOPHRENIA

Samantha M. Caspar[†] and Artem M. Joukov^{††}

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I. INTRODUCTION

The legalization of marijuana in many states may bring with it additional dangers to a segment of the United States population. If left unaddressed, marijuana consumption by individuals who have a predisposition for developing schizophrenia may lead to an increase in the development and the severity of the disease, especially since individuals with schizophrenia sometimes self-medicate with marijuana (regardless of its legality in their respective states) due to a false perception that it helps them cope with the symptoms.¹ That perception is even more troubling because marijuana has been shown to exacerbate schizophrenia in individuals who have developed the disease and to increase the likelihood of disease development in individuals who have predispositions to the disease.² Numerous studies discuss a connection between marijuana use and schizophrenia development.³ The majority of these studies conclude that marijuana

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1. See Andrei Szoke et al., *Association Between Cannabis Use and Schizotypal Dimensions — A Meta-Analysis of Cross-Sectional Studies*, 219 PSYCHIATRY RES. 58, 58–66 (2014).
 2. *Id.* at 58–59.
 3. See Sven Andréasson et al., *Cannabis and Schizophrenia: A Longitudinal Study of Swedish Conscripts*, 330 LANCET 1483, 1483 (1987); see also Michael T. Compton et al., *Association of Pre-Onset Cannabis, Alcohol, and Tobacco Use with Age at Onset of Prodrome and Age at Onset of Psychosis in First-Episode Patients*, 166 AM. J. PSYCHIATRY 1251, 1255 (2009); Louisa Degenhardt & Wayne Hall, *Is Cannabis Use a Contributory Cause of Psychosis?*, 51 CAN. J. PSYCHIATRY 556, 563 (2006); see Stephen M. Eggen et al., *Reduced Cortical Cannabinoid 1 Receptor Messenger RNA and Protein Expression in Schizophrenia*, 65 ARCHIVE GEN. PSYCHIATRY 772, 773 (2008); Szoke et al., *supra* note 1, at 59; Paola Casadio et al., *Cannabis Use in Young People: The Risk for Schizophrenia, Passing the Knife Edge in Adolescence: Brain Pruning and Specification of Individual Lines of Development*, 35 NEUROSCIENCE AND BIOBEHAVIORAL REV.S 1779, 1779 (2011); A. Eden Evins et al., *Does Using Marijuana Increase the Risk for Developing Schizophrenia*, 74 J. CLIN. PSYCHIATRY e8 (2013) [hereinafter Evins 2013]; Nikie Korver et al., *Symptomatology and Neuropsychological Functioning in Cannabis Using Subjects at Ultra-High Risk for Developing Psychosis and Healthy Controls*, 33 AUSTL. & N. Z. J. OF PSYCHIATRY 230, 231 (2010); A. Eden Evins et al., *The Effect of Marijuana Use on the Risk for Schizophrenia*, 73 J. CLIN. PSYCHIATRY 1463, 1465 (2012) [hereinafter Evins 2012]; see John Witton, *Cannabis Use and Physical Mental Health*, in A CANNABIS READER: GLOBAL ISSUES AND LOCAL EXPERIENCES, 117, 128 (Sharon Rodner Sznitman et al. eds., Monograph Ser. No. 8, 2008), http://www.emcdda.europa.eu/attachements.cfm/att_53398_EN_emcdda-cannabis-mon-vol2-ch6-web.pdf; Marla Paul, *Teen Marijuana Use Linked with Schizophrenia*, FUTURITY (Jan. 3, 2014), <http://www.futurity.org/teen-marijuana-abuse>.

use may trigger schizophrenia in those who are predisposed to the disease and may increase its severity because marijuana tends to harm underdeveloped areas of the brain that are of particular concern for individuals with schizophrenia or predispositions to the disease.⁴ Therefore, states that legalize marijuana should take precautions to help decrease this harmful effect. Additionally, Congress should consider developing federal regulations to help protect citizens from the dangers this drug presents to individuals predisposed to developing schizophrenia, especially when used at a young age.

In Part II, this Article will present a brief overview of marijuana's effects on a user's psyche. Part III will present some of the triggers and symptoms of schizophrenia. Next, Part IV of this Article will explain the connection between marijuana use and schizophrenia development, demonstrating that widespread regulation is vital to protect the small proportion of the population that will develop schizophrenia from marijuana use. This Part will also explain that such regulation is necessary even if it will temporarily restrict the drug's use by those who will not ultimately face the threat of developing this psychological condition. In Part V, this Article will discuss two precautions that lawmakers should take when legalizing marijuana. First, states should only legalize marijuana for people who are at least twenty-five years old or who have been cleared by a psychologist.⁵ Second, schizophrenics should have restricted access to marijuana regardless of their age because the drug exacerbates psychosis and may negatively interact with antipsychotic medications.⁶

II. MARIJUANA AND THE HISTORY OF ITS LEGALIZATION

Marijuana refers to dried leaves, flowers, stems, and seeds from *Cannabis sativa*, a plant that contains the psychoactive chemical delta-9-tetrahydrocannabinol (THC).⁷ When a user smokes marijuana, "THC quickly passes from the user's lungs into the bloodstream."⁸ Acting on specific molecular targets on brain cells called cannabinoid receptors, the user's blood cells carry the chemical to his or her brain.⁹

4. Szoke et al., *supra* note 1, at 58–66; *see also* sources cited *supra* note 3.

5. Casadio et al., *supra* note 3, at 1781.

6. Treffert, *Marijuana Use in Schizophrenia: A Clear Hazard*, 135 AM. J. PSYCHIATRY 1213–15 (1978), *available at* <http://www.ncbi.nlm.nih.gov/pubmed/29496>.

7. *DrugFacts: Marijuana*, NAT'L. INST. ON DRUG ABUSE, <http://www.drugabuse.gov/publications/drugfacts/marijuana> (last updated Aug. 2017).

8. *Id.*

9. *See id.*

Marijuana affects the central nervous system and can cause feelings of happiness and calm or feelings of paranoia and anxiety.¹⁰ Other effects include an altered perception of time and distance, impaired judgment, unsound decision-making, loss of coordination, slowed reaction time, sleepiness, and trouble thinking.¹¹

Marijuana is the most commonly used illegal drug in the United States.¹² Approximately one in ten adult Americans used the drug within the past year.¹³ Nearly one-third of the United States population has used marijuana at least once.¹⁴ Laws regarding the use and possession of marijuana have changed in recent years and many states have legalized the drug for medicinal or recreational use.¹⁵ Twenty-nine states and the District of Columbia have passed laws legalizing marijuana in some form, either for medical use, recreational use, or both.¹⁶

Many people believe that federal and state governments should legalize marijuana because of its potential economic benefits.¹⁷ Harvard economist Jeffrey Miron calculated that if federal and state governments legalized marijuana, both would experience significant savings.¹⁸ Federal, state, and local governments would save approximately \$8.7 billion per year in law enforcement costs.¹⁹ In

10. *See id.*

11. *Id.*

12. *What is the Scope of Marijuana Use in the United States?*, NAT'L INST. OF DRUG ABUSE, <https://www.drugabuse.gov/publications/research-reports/marijuana/what-scope-marijuana-use-in-united-states> (last updated Aug. 2017).

13. Aria Hangyu Chen, *One in Eight US Adults Says They Smoke Marijuana, Poll Says*, CNN (Aug. 8, 2016), <http://www.cnn.com/2016/08/08/health/marijuana-use-doubles-gallup-poll/index.html>.

14. Itai Danovitch, *Sorting Through the Science on Marijuana*, 43 MCGEORGE L. REV. 91, 91 (2012).

15. Charlie Tetiyevsky, *Where Is Marijuana Legal In The U.S.A.? The Definitive Guide To Weed Laws By State*, HERB (Nov. 15, 2017), <https://herb.co/marijuana/news/where-is-marijuana-legal-united-states..>

16. Alaska, California, Colorado, the District of Columbia, Maine, Massachusetts, Nevada, Oregon, and Washington have legalized marijuana for recreational use. Arizona, Arkansas, Connecticut, Delaware, Florida, Hawaii, Illinois, Maryland, Michigan, Minnesota, Montana, New Hampshire, New Jersey, New Mexico, New York, North Dakota, Ohio, Pennsylvania, Rhode Island, Vermont, and West Virginia have legalized medical marijuana. *See* Melia Robinson and Skye Gould, *This Map Shows Every State That Legalized Marijuana on Election Day*, BUS. INSIDER (Nov. 9, 2009), <http://www.businessinsider.com/where-is-marijuana-legal-2016-11>.

17. David Sheff, *Marijuana Should Be Legal, But . . .*, TIME (Aug. 4, 2014), <http://time.com/3079707/marijuana-legalization-teens-health>.

18. *Id.*

19. *Id.*

addition, marijuana taxation would raise approximately \$6.2 billion per year if the government taxed the drug at a rate similar to alcohol and tobacco: an amount that would allow the federal government to obtain an extra \$13.9 billion per year in tax revenues.²⁰ Other potential benefits of marijuana legalization include reduced crime and positive medicinal effects for those suffering with certain physical conditions.²¹ Opponents of marijuana legalization cite possible concerns with addiction, mental health, and physical health.²² Specifically, opponents point to the potential for higher rates of lung cancer and birth defects as reasons not to legalize marijuana.²³

III. SCHIZOPHRENIA

Schizophrenia is a chronic, severe, and debilitating brain disease that affects approximately one percent of the United States population ages eighteen and older in a given year.²⁴ The potential development and worsening of schizophrenia also presents²⁵ an argument against marijuana's unrestricted legalization. Schizophrenia can cause deterioration in thinking, disturbances in perception, and impairments of social function.²⁶ Positive symptoms of schizophrenia include hallucinations, delusions, thought and movement disorders, a monotonous voice, and a motionless face.²⁷ Negative symptoms include social with-

19. Sheff, *supra* note 17.

20. *Id.*

21. See Robert G. Morris et al., *The Effect of Medical Marijuana Laws on Crime: Evidence from State Panel Data, 1990-2006*, 9 PLOS 1, 4 (Mar. 26, 2014), <http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0092816&type=printable>; Wynne Armade, *Marijuana: Health effects of recreational and medical use*, HARV. MED. SCHOOL (Aug. 19, 2016), <https://www.health.harvard.edu/blog/the-health-effects-of-marijuana-from-recreational-and-medical-use-2016081910180>.

22. Stuart Gitlow, *Marijuana Legalization is a Risk Not Worth Taking*, CNN (July 30, 2014), <http://www.cnn.com/2014/07/30/opinion/gitlow-marijuana-use>.

23. Marcus Wohlsen, *Calif. regulators warn of pot's cancer capability*, SAN DIEGO UNION-TRIB. (July 4, 2009), <http://www.sandiegouniontribune.com/sdut-us-marijuana-cancer-070409-2009jul04-story.html>.

24. See *What is Schizophrenia*, THE NAT'L. INST. OF MENTAL HEALTH (Feb. 2016), <http://www.nimh.nih.gov/health/topics/schizophrenia/index.shtml>; *Schizophrenia-Fact Sheet*, TREATMENT ADVOC. CTR. (Aug. 13, 2008), <http://www.treatmentadvocacycenter.org/evidence-and-research/learn-more-about/25-schizophrenia-fact-sheet>.

25. *What is Schizophrenia*, *supra* note 24.

26. See *id.*

27. *Id.*

drawal, the inability to make decisions, and a lack of motivation and emotion.²⁸ Both positive and negative symptoms typically begin between ages sixteen and thirty.²⁹ A person rarely develops the disease after age forty-five.³⁰ The most common age of schizophrenia onset is twenty-seven for a female and twenty-five for a male.³¹

Schizophrenia treatments include antipsychotic medication, psychosocial treatment, rehabilitation, cognitive behavior therapy, and self-help groups.³² These treatments may help to relieve many symptoms of the disease, but most people with schizophrenia suffer from symptoms their entire lives.³³ Schizophrenics attempt suicide more often than the general population, and approximately ten percent die by suicide.³⁴ Studies also show that individuals diagnosed with this disease are four times more likely to engage in violent conduct—though rates of violence can be far higher for non-schizophrenic individuals who use drugs.³⁵

Medical experts believe that several factors can cause schizophrenia.³⁶ Foremost, experts have identified a genetic component to developing schizophrenia because of a recent study involving 28,799 schizophrenic patients and because of the disease's prevalence among those individuals with affected relatives.³⁷ Other possible causes of schizophrenia include the malfunction of a gene that creates certain chemicals in the brain, an imbalance of dopamine and glutamate, and environmental triggers.³⁸

28. *Id.*

29. *See Schizophrenia In-Depth Report*, N.Y. TIMES (2008), <http://www.nytimes.com/health/guides/disease/schizophrenia/print.html>.

30. *Id.*

31. *Id.*

32. *What is Schizophrenia*, *supra* note 24.

33. *See id.*

34. *See Schizophrenia In-Depth Report*, *supra* note 29.

35. Candice T. Player, *Involuntary Outpatient Commitment: The Limits of Prevention*, 26 STAN. L. & POL'Y REV. 159, 192 (2015) (citing Jeffrey W. Swanson, *Mental Disorder, Substance Abuse, and Community Violence: An Epidemiological Approach*, in *VIOLENCE AND MENTAL DISORDER* 101 (John Monahan & Henry J. Steadman eds., 1994)).

36. *See, e.g.*, Nancy A. Melville, 'Landmark' Study Identifies Genetic Link to Schizophrenia, MEDSCAPE (2016), <http://www.medscape.com/viewarticle/858062>; *see also* Lindsay Stafford Mader, *Cannabis and Schizophrenia*, 99 THE J. OF THE AM. BOTANICAL COUNCIL 46, (2013).

37. Melville, *supra* note 36; *see also* Mader, *supra* note 36.

38. Mader, *supra* note 36.

IV. CONNECTION BETWEEN MARIJUANA AND SCHIZOPHRENIA
AND THE IMPLICATIONS OF MARIJUANA LEGALIZATION ON
SCHIZOPHRENIA

Unfortunately, the effects of marijuana use on individuals with diagnosed or undiagnosed schizophrenia are not always at the forefront of the marijuana-legalization debate.³⁹ This may be because schizophrenia is not a widespread psychological illness or because the effect of marijuana use by schizophrenics is not widely known.⁴⁰ Nevertheless, the legalization debate *should* consider the drug's availability to schizophrenics and individuals who have a predisposition for developing the disease. Because carefully crafted marijuana laws could prevent many of marijuana's harmful effects on people who are susceptible to this psychological disorder, legislation that is conscious of these problems could decrease schizophrenia's harmful effects.

*a. Introduction to the Connection Between Marijuana Use and
Schizophrenia Development*

Many individuals may perceive marijuana as a harmless recreational drug, but its use *can* cause harmful results.⁴¹ For instance, marijuana can result in physiological and psychological effects similar to symptoms that schizophrenics experience, such as visual illusions, paranoia, mood alterations, and memory defects.⁴² The research regarding marijuana's impact on schizophrenia includes epidemiological studies finding marijuana use to be associated with developing schizophrenia, even after the studies controlled for several other factors.⁴³ These studies conclude that a healthy person with no schizophrenia risk factors is unlikely to develop the disease from marijuana use alone.⁴⁴ However, marijuana use can trigger schizophrenia in people who are predisposed to the disease, including individuals who have close relatives with schizophrenia, given

39. *See The Good, Bad, and Unknown About Marijuana's Health Effects*, CBS, <https://www.cbsnews.com/news/marijuanas-health-effects-good-bad-unknown> (last updated Jan. 12, 2017).

40. *See The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*, THE NAT'L ACAD. OF SCI., ENGINEERING, AND MED. 19 (2017).

41. *See id.*

42. *See id.* at 125.

43. *See* Casadio et al., *supra* note 3, at 1783.

44. *Marijuana and Mental Illness*, THE NAT'L ALLIANCE ON MENTAL ILLNESS (Mar. 2013), https://www.ninthdistrictpta.org/wp-content/uploads/2016/08/marijuana_factsheet__-NAMI.pdf; *see also* Andréasson et al., *supra* note 3, at 1483; and *see* Eggen et al., *supra* note 3.

schizophrenia's strong genetic link.⁴⁵ In this population, marijuana users are diagnosed with schizophrenia at a younger age, hospitalized more often for their illness, and are less likely to completely recover from the disease, even with high-quality treatment.⁴⁶ Those individuals predisposed to schizophrenia are four times more likely to develop the disease after using marijuana.⁴⁷

While approximately three percent of marijuana users develop schizophrenia, proper marijuana regulations can significantly decrease the disease's emergence by making it more difficult for the individuals predisposed to schizophrenia to obtain marijuana.⁴⁸ Risk factors for developing schizophrenia include heavy marijuana use at a young age,⁴⁹ genetic vulnerability, and emotional stress, with marijuana acting as a component cause of psychosis.⁵⁰ Although the approximate three percent of marijuana users who develop schizophrenia may seem small in comparison to the rest of the population, protecting these individuals is crucial because the symptoms of schizophrenia are debilitating and may even affect others.

b. Criticism of the Studies

Studies finding a connection between marijuana use and schizophrenia development have met occasional criticism.⁵¹ Conflicting articles claim there is a link between the two not because marijuana

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45. *Marijuana and Mental Illness*, *supra* note 44; *see also* Mader, *supra* note 36.
46. *Marijuana and Mental Illness*, *supra* note 44.
47. *See* Cecile Henquet et al., *Prospective Cohort Study of Cannabis Use, Predisposition for Psychosis, and Psychotic Symptoms in Young People*, 330 THE BMJ 1, 2 (Dec. 30, 2004). If an individual's relative is diagnosed with schizophrenia, the individual has a ten percent chance of developing schizophrenia, instead of the typical one percent chance of developing the disease. However, if an individual has an identical twin with the disorder, the risk of developing schizophrenia is increased forty to sixty-five percent. Paula Mejia, *Schizophrenia is Actually Eight Distinct Genetic Disorders: New Study*, NEWSWEEK (Sept. 8, 2014), <http://www.newsweek.com/schizophrenia-actually-eight-distinct-genetic-disorders-according-new-study-271407>.
48. Basu & Parakh, *Cannabis and Psychosis: Have We Found the Missing Link?*, 6 ASIAN J. OF PSYCHIATRY 281, 281–87 (2013).
49. *See* Jason Rehel, *Marijuana Use by Teens Linked to Permanent Brain Abnormalities Later in Life*, NAT'L POST (July 25, 2013), http://news.nationalpost.com/2013/07/25/marijuana-use-by-teens-linked-to-permanent-brain-abnormalities-later-in-life-u-s-study/#___federated=1; *Marijuana and Mental Illness*, *supra* note 44.
50. *Schizophrenia In-Depth Report*, *supra* note 30.
51. *See* Maia Szalavitz, *The Link Between Marijuana and Schizophrenia*, TIME (Feb. 7, 2011), <http://content.time.com/time/health/article/0,8599,2005559-1,00.html>.

causes schizophrenia, but because those with a genetic susceptibility to schizophrenia are more likely to use marijuana.⁵² These articles explain that schizophrenia rates have not escalated even though marijuana usage has expanded over the past fifty years.⁵³ The articles argue that if marijuana increased the chance of manifesting schizophrenia symptoms, the percentage of people exhibiting schizophrenia symptoms would have increased proportionally to the percentage of marijuana use.⁵⁴ According to critics, the lack of this correlation undermines the conclusion that marijuana use increases the likelihood of developing schizophrenia.⁵⁵

A few studies that support the connection between marijuana use and schizophrenia argue that this stagnation is due to other factors, such as improvements in prenatal nutrition and healthcare that help lower the disease's prevalence rate.⁵⁶ These studies also explain that the stagnant rate of schizophrenia diagnoses is because of the improved accuracy of medical diagnoses in recent years.⁵⁷ For instance, many people previously incorrectly diagnosed with schizophrenia are now diagnosed with other illnesses, such as Asperger's syndrome or bipolar disorder.⁵⁸

c. Literature Review of the Studies and Solutions

A literature review completed in 2014 synthesized data from twenty-nine studies that have explored the possibility of a connection between marijuana use and schizophrenia development.⁵⁹ The authors of this review conducted a systematic survey of the literature by identifying all articles that reported cross-sectional data on schizophrenia and marijuana use.⁶⁰ The authors also contacted experts in the field to ask if they knew of other studies that the authors could not identify by searching the PubMed and PsychInfo databases.⁶¹ When available data in the articles proved insufficient, the literature

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52. Robert A. Powers et al., *Genetic Predisposition to Schizophrenia Associated with Increased Use of Cannabis*, 12 MOL. PSYCHIATRY 1201, 1204 (2014).
53. Mader, *supra* note 5.
54. *Id.*
55. *Id.*
56. *Id.*
57. *Id.*
58. See *Autism Spectrum Disorder*, NAT'L INST. OF MENTAL HEALTH, <https://www.nimh.nih.gov/health/topics/autism-spectrum-disorders-asd/index.shtml> (last updated Oct. 2016).
59. Szoke et al., *supra* note 1, at 58
60. *Id.*
61. *Id.* at 60.

review authors contacted the authors of the individual articles to obtain supplementary information.⁶² Ultimately, the authors obtained fifty-three articles, excluding twenty-four of these articles because of irrelevance or insufficient information.⁶³ After reviewing the remaining studies, the literature review concluded that marijuana use increases an individual's risk of developing schizophrenia if the individual is predisposed to the disease.⁶⁴ The literature review compared the risk of developing schizophrenia between subjects that had never used marijuana and subjects that had used it at least once and between current users and subjects that do not currently use marijuana to arrive at this conclusion.⁶⁵ This review, however, acknowledged the need for more research to explore this connection more thoroughly.⁶⁶

The majority of studies exploring the possible connection between marijuana use and schizophrenia development conclude that marijuana use causes schizophrenia and increases its severity in certain individuals.⁶⁷ Therefore, states, and perhaps the federal government, should carefully construct restrictions that prevent individuals younger than twenty-five and those predisposed to schizophrenia from obtaining the drug. For example, if a particular state legalizes marijuana, lawmakers should enact an age limitation of twenty-five before a person may legally obtain the drug.⁶⁸ Moreover, state laws should impose additional restrictions on an individual's ability to access marijuana if a physician diagnoses the individual with schizophrenia. Imposing an age limitation on the drug and restricting schizophrenics' access to it will considerably decrease many of the psychological problems connected to marijuana's relationship to schizophrenia development. An age limitation would also reduce the severity of schizophrenia symptoms by restricting marijuana use to those individuals whose brains are fully developed and have no known predisposition to developing the disease.

d. The Necessity of Protecting Three Percent of Marijuana Users

Because only approximately three percent of people who use marijuana develop schizophrenia,⁶⁹ some people may argue that lawmakers should avoid broad policies when seeking to protect such a

62. *Id.*

63. *Id.*

64. *Id.* at 58.

65. *Id.*

66. *Id.* at 65.

67. *Id.* at 64; *see also* sources cited *supra* note 3.

68. *See infra* Section V(a)(iv).

69. Basu & Parakh, *supra* note 47, at 281–87.

small proportion of the population.⁷⁰ Schizophrenia, however, is one of the costliest mental disorders: the cost for direct treatment of schizophrenia is two times higher than the cost of major depression and more than four times higher than any anxiety disorder.⁷¹ Schizophrenia is also associated with a high risk of relapse and hospitalization, further raising the cost of this disease.⁷² Some individuals with schizophrenia can exhibit dangerous tendencies toward themselves and others, including conduct ranging from domestic violence to murder.⁷³ Several factors contribute to these dangerous tendencies, such as stopping medication, experiencing more severe symptoms, or never receiving a proper diagnosis. These effects not only result in potentially drastic consequences for individuals but also strain law enforcement.⁷⁴

The cost of schizophrenia in the United States exceeded \$155 billion in 2013.⁷⁵ In addition to this immense cost, an individual who develops schizophrenia at a younger age is more likely to develop a more severe form of the disease.⁷⁶ Although only a small percentage of people develop schizophrenia from marijuana use, this risk often occurs during a time of vulnerable brain development, because marijuana use is prevalent among teenagers and young adults.⁷⁷ Implementing the necessary restrictions on marijuana can help obviate this risk.⁷⁸

70. *Id.*

71. Baojin Zhu et al., *Costs of Treating Patients with Schizophrenia Who Have Illness-Related Crisis Events*, BMC PSYCHIATRY (Aug. 26, 2008), <http://www.biomedcentral.com/1471-244X/8/72>.

72. *See id.*

73. *See* Jason C. Matejowski et al., *Characteristics of Persons with Severe Mental Illness Who Have Been Incarcerated for Murder*, 36 J. AM. ACAD. PSYCHIATRY & L. 74, 74, 80 (2008) (finding that more than fifty percent of the offenders also had a history of drug abuse or alcohol abuse).

74. *See* Joanne Silberner, *Training Police to Handle Mental Illness Cases*, NPR (May 21, 2009), <https://www.npr.org/templates/story/story.php?storyId=104350808>; *see also* Liza Lucas, *Changing the Way Police Respond to Mental Illness*, CNN, <http://www.cnn.com/2015/07/06/health/police-mental-health-training/index.html> (last updated Sept. 28, 2016).

75. *See* Eric Wu, Annie Guérin, and Martin Cloutier, *The High Cost of Schizophrenia*, TREATMENT ADVOCACY CTR. (JUNE 2016), <http://www.analysisgroup.com/economic-burden-schizophrenia-in-us>.

76. *Schizophrenia In-Depth Report*, *supra* note 30; *see also* Szalavitz, (Part V of this Article will explain why a person who develops schizophrenia at a younger age is more likely to develop a more severe form of the disease).

77. Rehel, *supra* note 49.

78. *Id.*

V. SOLUTIONS TO DECREASE MARIJUANA'S NEGATIVE
EFFECTS ON SCHIZOPHRENIA'S DEVELOPMENT AND SEVERITY

Due to marijuana's potential harmful effects on schizophrenics or those with a predisposition to the disease, lawmakers should come prepared with legal policies to address this concern when deciding to legalize the drug. These policies should be two-fold: they should prevent all teenagers and young adults from using the drug until their physiological and psychological development reaches a certain stage and they should restrict individuals diagnosed with the disease from possessing the drug altogether.

a. *Imposing an Age Limitation of Twenty-Five on Marijuana Use*

Medical and psychological studies indicate that the human brain does not become mature until the age of twenty-five, though some variations exist between the genders and some individuals may mature slightly faster or slower.⁷⁹ Perhaps fittingly, schizophrenia becomes less prevalent once an individual reaches this age without showing major symptoms.⁸⁰ Even if the individual subsequently develops schizophrenia, his or her symptoms are far less severe than a person who develops symptoms at an earlier age.⁸¹ In addition, marijuana's effects on the brain also diminish once the brain reaches maturity.⁸² Thus, legislators can draw a bright line concerning marijuana consumption at the age of twenty-five, unless the individual can obtain clearance from a psychologist that he or she has little-to-no risk of developing schizophrenia from marijuana.

i. *A Person Under Age Twenty-Five Who Uses Marijuana is More
Likely to Develop Schizophrenia*

Over the past few years, the world has experienced a twenty-fold increase in first time marijuana use in people under the age of eighteen.⁸³ This increase is alarming when viewed through the lens of schizophrenia development: marijuana use during adolescence creates

79. See Kelly Fleming, *What Smoking Weed Does to Teen Brains*, THE STRANGER (Oct. 22, 2014), <http://www.thestranger.com/seattle/what-smoking-weed-does-to-teen-brains/Content?oid=20884581>; Rehel, *supra* note 49.

80. *What is Schizophrenia*, *supra* note 24; Rehel, *supra* note 49.

81. See Lynn DeLisi, *The Significance of Age of Onset for Schizophrenia*, 18 SCHIZOPHRENIA BULL. 209 (1992); see also Folsom et al., *Schizophrenia in Late Life: Emerging Issues*, 8 DIALOGUES CLINICAL NEUROSCI. 45, 46 (2006).

82. See Rehel, *supra* note 49.

83. Paolo Casadio et al., *Cannabis Use in Young People: The Risk for Schizophrenia*, 35 NEUROSCIENCE & BEHAVIORAL REV. 1779, 1780 (2011).

a particularly high risk of developing schizophrenia because the drug causes structural and functional changes to still-developing brains.⁸⁴ Marijuana also impairs adolescents' memory and ability to process information.⁸⁵ Furthermore, an estimated seventeen percent of adolescents become addicted to marijuana, as compared to only nine percent of adults.⁸⁶ Therefore, imposing an age limitation of twenty-five on marijuana use should help reduce schizophrenia's development.

Those who use marijuana at an early age place themselves at a higher risk of developing schizophrenia because the brain is more vulnerable at a young age.⁸⁷ Most of the studies find that the younger a person is when he or she starts using marijuana, the higher the person's risk for developing schizophrenia because the brain is still developing.⁸⁸ For instance, an adolescent has an increased risk of developing schizophrenia if he or she uses marijuana before reaching the age of sixteen than if he or she starts using the drug after the age of sixteen.⁸⁹ These results did not analyze the lifetime frequency of marijuana use, but marijuana use before age eighteen is especially problematic.⁹⁰

In addition, the risk of developing schizophrenia strongly correlates with the number of times an individual uses the drug before age eighteen.⁹¹ Specifically, the risk of developing schizophrenia is 130 percent higher for individuals who use marijuana between one and ten times, 200 percent higher for those who use marijuana between ten and fifty times, and 600 percent higher for those who use marijuana more than fifty times.⁹² Additionally, a person is almost five times more likely to develop schizophrenia by the age of twenty-six if he or she regularly uses marijuana at the age of fifteen.⁹³ These conclusions take into account any psychotic symptoms preceding marijuana use

84. See Sheff, *supra* note 17.

85. *Id.*

86. *Marijuana Facts for Teens*, NAT'L. INSTI. ON DRUG ABUSE (July 2013), https://www.drugabuse.gov/sites/default/files/teens_brochure_2013.pdf.

87. Casadio et al., *supra* note 3, at 1783.

88. See Evins 2013, *supra* note 3, at e8.

89. See N.C. Stefanis et al., *Early Adolescent Cannabis Exposure and Positive and Negative Dimensions of Psychosis*, 99 SOC'Y. FOR THE STUDY OF ADDICTION 1333, 1337 (2004).

90. Korver et al., *supra* note 3.

91. See Witton, *supra* note 3, at 129.

92. *Id.*

93. See Louise Arseneault et al., *Cannabis use in adolescence and risk for adult psychosis: longitudinal prospective study*, 325 BRIT. J. OF MED. 1212, 1212 (Nov. 2002).

and control for other factors.⁹⁴ Between eight and thirteen percent of all schizophrenia cases are connected to using marijuana during teen years.⁹⁵ Specifically, “[e]arly, heavy cannabis use seems to be associated with the greatest risk for developing schizophrenia.”⁹⁶ These results are significant because the younger a person is when he or she develops schizophrenia, the more severe his or her illness and the more difficult the recovery is likely to be.⁹⁷

ii. Effects of Marijuana on Brain Development in People Under
Twenty-Five

A teenager who uses marijuana develops abnormal changes in his or her brain structure more often than a teenager who does not use the drug.⁹⁸ These abnormalities continue to exist many years after the individual ceases consuming marijuana.⁹⁹ This research indicates that the drug causes long-term effects when a person starts to use it at a young age.¹⁰⁰ The brain abnormalities that occur in these teenagers are very similar to schizophrenia-related brain abnormalities.¹⁰¹ The younger a person is when he or she uses marijuana, the more abnormally his or her brain regions are shaped, demonstrating that the brain is more susceptible to marijuana’s negative effects if an individual uses the drug at an early age.¹⁰² In this specific study, ninety percent of the marijuana users who developed schizophrenia started to use marijuana heavily prior to developing the disease.¹⁰³

Marijuana use before the age of twenty-five presents a particular danger because the brain is still forming during the teenage and young-adult years.¹⁰⁴ Tissue is continuing to “develop . . . connections between brain regions and produc[e] the cells that process

94. *Id.*

95. *Marijuana/Cannabis and Schizophrenia*, SCHIZOPHRENIA.COM, <http://www.schizophrenia.com/prevention/streetdrugs.html> (last visited Sept. 28, 2017).

96. Evins 2012, *supra* note 3, at 1465.

97. *See Cannabis and Psychosis*, BRIT. COLUMBIA SCHIZOPHRENIA SOC’Y., <http://www.heretohelp.bc.ca/sites/default/files/cannabis-marijuana-and-psychosis.pdf> (last visited Sept. 29, 2017).

98. *See* Marla Paul, *Teen Marijuana Use Linked with Schizophrenia*, FUTURITY (Jan. 3, 2014), <http://www.futurity.org/teen-marijuana-abuse>.

99. *Id.*

100. *See id.*

101. *Id.*

102. *Id.*

103. *Id.*

104. Rehel, *supra* note 49.

information. Neurodevelopment is particularly active during childhood and adolescence and continues until at least age 25.¹⁰⁵ The frontal cortex, which is the area of the brain that controls planning and impulses, develops last.¹⁰⁶ Unfortunately, the frontal cortex is also the area most affected by schizophrenia.¹⁰⁷

Using marijuana while the brain is still developing can cause a substantial and negative impact on brain structure volume and the quality of white matter: a cause of schizophrenia.¹⁰⁸ Brain structure volume and the quality of white matter mature during adolescence through young adulthood and affect learning and brain functions.¹⁰⁹ In addition, researchers believe that using marijuana while the brain is still developing “boosts levels of dopamine in the brain, which may lead directly to schizophrenia.”¹¹⁰ The brain is less vulnerable to these negative effects after it has finished developing.¹¹¹ As a result, marijuana legislation should include a national age limitation of twenty-five before a person may legally use the drug—rather than an age limitation of twenty-one, where many jurisdictions have currently set it—unless the individual acquires certification from a medical professional that he or she exhibits no signs that marijuana use will lead to schizophrenia.¹¹² This age limitation should help decrease marijuana’s negative psychological effects.

iii. Detrimental Effects of an Earlier Age of Schizophrenia Onset

A recent study found that marijuana users developed schizophrenia almost three years earlier than those who did not use the drug.¹¹³ This study provides evidence of a strong relationship between marijuana use and an earlier age of schizophrenia onset.¹¹⁴ These results are concerning because the age of onset appears to be related to the severity of the disease and a more negative prognosis for subsequent escalation.¹¹⁵ Imposing an age limitation of twenty-five on

105. Fleming, *supra* note 79.

106. Rehel, *supra* note 49.

107. *Id.*

108. *Id.*

109. *Id.*

110. *Marijuana/Cannabis and Schizophrenia*, *supra* note 94.

111. *See* Rehel, *supra* note 49.

112. *See generally Medical Marijuana Laws by State*, FINDLAW (2017), <http://healthcare.findlaw.com/patient-rights/medical-marijuana-laws-by-state.html>.

113. Szalavitz, *supra* note 51.

114. *Id.*

115. *Schizophrenia In-Depth Report*, *supra* note 30.

a person's ability to access marijuana should help delay schizophrenia's onset.

There are many benefits to delaying schizophrenia's onset age, since generally, the earlier that schizophrenia develops, the more severe the disease and the worse the prognosis.¹¹⁶ According to a recent study, an individual with earlier-onset schizophrenia experiences more intense cognitive defects, while individuals who develop the disease later have "relatively preserved cognitive functions."¹¹⁷ In a study of hospitalized schizophrenic patients, those who developed schizophrenia at an age below the median onset age were more likely to show cognitive impairments, negative symptoms, and behavioral deterioration than those who developed schizophrenia at an age above the median (twenty-five for males and twenty-eight for females).¹¹⁸ Patients diagnosed with schizophrenia at an older age also exhibited fewer and less severe positive symptoms and required lower daily doses of antipsychotic medications.¹¹⁹ Moreover, schizophrenia in a person under age thirteen is approximately twenty to thirty times more severe than adult-onset schizophrenia.¹²⁰ A neurologist at the National Institute of Mental Health estimated that these individuals actively hallucinate ninety-five percent of the time they are awake.¹²¹

Additionally, another study showed that an earlier age of schizophrenia onset is strongly connected with increased impairment of activities involving motor and language skills, which are functions controlled by the frontal, temporal, and subcortical regions of the brain.¹²² An earlier age of onset is further associated with impairment of verbal learning and memory.¹²³ The ventricular size of the brain also increases with an earlier age of onset.¹²⁴ This fact is significant because studies have shown that greater ventricular size predicts a

116. *Id.*

117. T.K. Rajji et al., *Age at Onset and Cognition in Schizophrenia*, 195 BR. J. PSYCHIATRY 286, 286 (2009).

118. DeLisi, *supra* note 81, at 45–52.

119. *Id.*

120. Shari Roan, *Jani's at the Mercy of Her Mind*, L.A. TIMES (Oct. 23, 2012), <http://articles.latimes.com/2012/oct/03/health/la-he-schizophrenia29-2009jun29>.

121. *Id.*

122. Hoff et al., *A Neuropsychological Study of Early Onset Schizophrenia*, 20 SCHIZOPHRENIA RES. 21, 21 (1996).

123. See Annamari Tuulio-Henriksson et al., *Age at Onset and Cognitive Functioning in Schizophrenia*, 185 BRIT. J. OF PSYCHIATRY 215, 217 (2004).

124. DeLisi, *supra* note 81.

poorer outcome for schizophrenics in terms of the disease's severity and a person's recovery.¹²⁵

iv. Strategies to Help Prevent People Under Age Twenty-Five from
Obtaining Marijuana

In Colorado and Washington, the marijuana industry currently targets children and teenagers with edible and colorful products, such as Pot Tarts, Ring Pots, and coupons for marijuana products.¹²⁶ This type of packaging is designed to appeal to youth.¹²⁷ The marijuana industry's intention seems similar to the tobacco industry's "once-secret campaign aimed at youth, attempting to get teens addicted to marijuana and make them lifelong customers."¹²⁸ One argument commonly made against legalizing marijuana is that it would facilitate adolescents' ability to obtain the drug.¹²⁹ This argument, however, does not consider countermeasures that governments should implement alongside the drug's legalization.¹³⁰ It is vital that the Drug Enforcement Administration punish the marijuana industry's targeting of children and teenagers.

Furthermore, education and other preventative strategies should accompany legalization. Congress, along with state legislatures, should make it a criminal offense to sell marijuana to a person under age twenty-five and provide for strict enforcement of the statute.¹³¹ Otherwise, it may be relatively simple for a young person to obtain marijuana once legalized, despite the increased risk of schizophrenia development that its consumption brings at that age. The savings the government would receive from marijuana's legalization could fund these countermeasures.¹³²

125. *Id.*

126. See Judy Benson, *Group Urges Wariness Amid Marijuana Push*, THE DAY (June 18, 2014), <http://www.theday.com/article/20140618/NWS01/306189975>.

127. *Id.*

128. *Id.*

129. *Marijuana Use: Detrimental to Youth*, AM. COLL. OF PEDIATRICS (Apr. 2017), <https://www.acped.org/marijuana-use-detrimental-to-youth>.

130. See *id.*

131. Similar to, for example, laws against selling tobacco and alcohol to underage customers. See *e.g.*, FLA. STAT. 562.011 (2018); FLA. STAT. 877.112 (2018); ALA. CODE § 6-5-70 (2018); ALA. CODE § 13A-12-3 (2018).

132. See Sheff, *supra* note 17 (providing an estimate of how much revenue could be realized with legalization of marijuana).

b. *Psychological Clearance as an Alternative to Use Marijuana*

Some may argue that imposing a restriction on marijuana use for anyone under the age of twenty-five may be overly broad despite the potential benefit of preventing schizophrenia onset in some individuals. The majority of the population would not necessarily benefit from an age restriction as far as schizophrenia is concerned.¹³³ Therefore, state legislatures should consider adopting an additional measure to balance the popular support for marijuana's legalization with the state interest of preventing schizophrenia's onset or minimizing its effects. Rather than enacting a categorical ban on anyone under the age of twenty-five using the drug, legislatures should consider permitting marijuana use at an earlier age if the person receives clearance from a psychologist to do so.

After thoroughly screening for symptoms indicating that a person is at risk for developing the disease, a psychologist could grant clearance to an individual under twenty-five. While diagnosing schizophrenia may be quite difficult, especially when it comes to a single psychological evaluation, the process can have several positive outcomes. For most of the population wishing to use marijuana before their twenty-fifth birthday, the evaluation would clear them of any risk factors for schizophrenia and allow them to purchase the drug. If nothing else, the evaluation would allow medical professionals to screen for a disease that often goes undiagnosed for years.¹³⁴

For patients who show signs of schizophrenia or exhibit the potential to develop the disease in the future, the evaluation would give them notice to avoid marijuana use altogether. In addition, the evaluation could incentivize a patient to seek further diagnoses to determine whether he or she has schizophrenia or another mental disorder that sometimes presents with similar symptoms.¹³⁵ At this point, the evaluating psychologist should avoid granting clearance for marijuana use until the psychologist determines that the patient does not possess either schizophrenia proclivities that place the patient at risk for developing the disease in the future or another illness that marijuana use could exacerbate. Once the psychologist makes these determinations to a reasonable degree of confidence, the psychologist could clear the patient for marijuana use.

133. Basu & Parakh, *supra* note 48, at 281–87.

134. See *How is Schizophrenia Diagnosed?* LIVING WITH SCHIZOPHRENIA, <https://www.livingwithschizophreniauk.org/advice-sheets/how-is-schizophrenia-diagnosed> (last visited Nov. 28, 2017).

135. *Other Conditions with Symptoms Similar to Schizophrenia*, WEBMD, <https://www.webmd.com/schizophrenia/other-conditions-with-symptoms-similar-to-schizophrenia> (last visited Feb. 1, 2018).

No simple scan or blood test will enable psychologists to diagnose schizophrenia.¹³⁶ Rather, these specialists will rely on diagnostic interviews conducted between the patient and the psychiatrist.¹³⁷ The psychiatrist should check the patient's mental status by observing the patient's appearance and demeanor.¹³⁸ The psychiatrist should also ask about the patient's moods, hallucinations, delusions, and substance use and ask whether the patient is experiencing violent or suicidal thoughts.¹³⁹

For many years, the criteria that psychologists used to diagnose schizophrenia were very fluid.¹⁴⁰ This led to many misdiagnoses.¹⁴¹ Over the last two decades, however, recently developed diagnostic tools have become precise enough to reduce misdiagnoses, although misdiagnoses occur in approximately ten percent of cases.¹⁴² "In addition to asking a structured series of questions aimed at finding out how the patient is thinking," the psychiatrist should also consider other background information, such as family and personal history.¹⁴³

Most psychologists today use the Diagnostic and Statistical Manual to diagnose schizophrenia.¹⁴⁴ The Manual considers four main types of symptoms when determining whether an individual presents with schizophrenia: delusions, hallucinations, thought disorders, and negative symptoms such as apathy or withdrawal.¹⁴⁵ Because mental disorders can be complex, the psychologist may make an initial diagnosis, called a working diagnosis, which the psychologist may later change when the psychologist is more familiar with the patient.¹⁴⁶ The following are all features that the psychologist should note:

Withdrawal: Has the person become withdrawn from friends and family? Does he or she spend all day in his or her room and refuse to spend time with the family?

136. *How is Schizophrenia Diagnosed?*, *supra* note 134.

137. *Id.*

138. *See id.*

139. *Schizophrenia*, MAYO CLINIC, <http://www.mayoclinic.org/diseases-conditions/schizophrenia/diagnosis-treatment/diagnosis/dxc-20253209> (last visited Sept. 29, 2017).

140. *How is Schizophrenia Diagnosed?*, *supra* note 134.

141. *Id.*

142. *Id.*

143. *Id.*

144. *Id.*

145. *Id.*

146. *Id.*

Strange ideas: Has the person expressed strange ideas about being spied on or persecuted? Has the individual developed strange religious ideas or ideas about aliens? Does he or she relate things that happen in the world news to himself or herself?

Risky behaviors: Has the person started to drive dangerously or started to harm himself or herself? Has the individual become sexually disinhibited? Did the subject have any recent altercations with the police?

Emotional Responses: Does the person appear afraid or agitated for no reason? Do the individual's responses appear blunted emotionally or paradoxical (appearing happy when something bad happens and sad when something good happens)?

Changes in activity: Has the person given up studying or work for no apparent reason? Does the subject stay up at night and then sleep during the day? Has the individual started to attend church frequently or spend lots of time shopping? Has he or she been spending lots of money on things he or she does not need?

Performance: Has the subject's performance at work or college suddenly declined? Has the person become lax with personal hygiene or obsessive about it? Has he or she become very forgetful? Does the individual forget about appointments and arrangements he or she has made?

A psychologist will diagnose a patient with schizophrenia upon meeting four conditions: (1) the person must have at least one clear symptom that is characteristic of schizophrenia, such as hearing voices; (2) the symptom(s) must have been present for at least one month and the disturbances to the individual's life must have been evident for at least six months; (3) the symptoms must be impacting on the person's social functioning or their occupation, such as employment or studying; and (4) other conditions that may cause the symptom, such as use of street drugs, can be ruled out.¹⁴⁷

c. Restricting Marijuana Use by Schizophrenics

Lawmakers can reduce schizophrenia's negative effects by restricting schizophrenics or individuals who are predisposed to schizophrenia from using the drug and by imposing general age restrictions on its use. Numerous studies have shown that marijuana not only exacerbates the symptoms of this disease but also interferes with

147. *Id.*

effective treatment.¹⁴⁸ Since schizophrenia often affects more than the patient—such as the patient’s caretakers or individuals who are harmed if the patient becomes violent¹⁴⁹—legislators across the country should consider limiting schizophrenics’ access to the drug. While a patient may not necessarily resort to violent action because of marijuana use, THC may harm a patient who is trying to combat schizophrenia.¹⁵⁰ These additional effects outweigh whatever benefits an individual may gain from consuming marijuana.

i. Symptom Exacerbation in Schizophrenics Who Use Marijuana

Since the 1970s, scientists have known that marijuana can harm schizophrenics. In 1978, one of the first studies explaining marijuana’s negative effects on those diagnosed with schizophrenia demonstrated that marijuana use as an independent variable produced a “serious exacerbation” of psychosis in schizophrenics whose illness was well controlled with antipsychotic medication.¹⁵¹ Every time each subject used marijuana, the individual experienced exacerbation and deterioration of his or her condition.¹⁵² This reaction is consistent with the conclusion that schizophrenics are more likely to experience negative emotions when using marijuana, including depression, anxiety, or paranoia.¹⁵³ Marijuana’s interaction with certain chemicals in the brain, including dopamine, causes these emotions.¹⁵⁴

A recent study further determined that schizophrenics who use marijuana are more likely to suffer problems such as negative family relationships, increased crime and violence, and escalating isolation.¹⁵⁵ Schizophrenics who use marijuana also experience more trouble with memory tests compared to schizophrenics who abstain from the drug.¹⁵⁶ In addition, schizophrenics who use marijuana are more likely than other schizophrenics to skip their treatments, including antipsy-

148. See J. R. Minkel, *Marijuana Worsens Schizophrenia*, LIVE SCIENCE (2010), <http://www.livescience.com/10700-marijuana-worsens-schizophrenia.html>.

149. Farshid Shamsaei et al., *Burden on Family Caregivers Caring for Patients with Schizophrenia*, 10 IRAN J. PSYCHIATRY 239, 243 (2015).

150. See Minkel, *supra* note 148.

151. *Id.*

152. *Id.*

153. *Marijuana and Mental Illness*, *supra* note 44, at 1.

154. *Id.*

155. *Marijuana/Cannabis and Schizophrenia*, *supra* note 95.

156. Minkel, *supra* note 148.

chotic medication and behavioral therapy, which could result in further exacerbation of symptoms.¹⁵⁷

Marijuana use increases a schizophrenic's relapse rate and causes an individual to suffer more profoundly from visual hallucinations.¹⁵⁸ Hours after a schizophrenic uses marijuana, his or her hallucinations become much worse.¹⁵⁹ Doctors at Yale University tested the impact of marijuana on 150 healthy volunteers and thirteen people with stable schizophrenia.¹⁶⁰ The doctors originally expected to see marijuana improve the schizophrenics' conditions, as many of these patients reported that marijuana decreased their anxiety.¹⁶¹ However, the reverse was true.¹⁶² The doctors intended to study marijuana's impact on more schizophrenic patients, but the doctors had to stop the study "prematurely because the impact was so pronounced it would have been unethical to test it on more people with schizophrenia."¹⁶³ This study underscores the drug's negative impact on individuals exhibiting schizophrenia symptoms.

Marijuana use in schizophrenics also causes symptom exacerbation and increased hospitalizations.¹⁶⁴ Schizophrenics who use marijuana experience a loss of brain volume that is significantly greater than schizophrenics who do not use the drug.¹⁶⁵ This loss can aggravate schizophrenia by increasing the severity and frequency of the individual's symptoms.¹⁶⁶ It is common for a schizophrenic to experience a psychotic episode after he or she uses marijuana.¹⁶⁷ Symptom exacerbation results from marijuana's effect on a schizophrenic's levels of the neurotransmitter anandamide.¹⁶⁸ Studies have shown that people with higher levels of anandamide experience fewer psychotic sym-

157. *See Drug Abuse and Schizophrenia*, ELEMENTS BEHAVIORAL HEALTH (Feb. 14, 2013), <http://www.elementsbehavioralhealth.com/dual-diagnosis/drug-abuse-and-schizophrenia>.

158. Korver et al., *supra* note 3.

159. Tucker Reals, *Doctors: Marijuana Triggers Psychosis*, CBS NEWS (2007), <http://www.cbsnews.com/news/doctors-marijuana-triggers-psychosis>.

160. *Id.*

161. *Id.*

162. *Id.*

163. *Id.*

164. *See Mader, supra* note 36; *see also Minkel, supra* note 148.

165. Nancy A. Melville, 'Landmark' Study Identifies Genetic Link to Schizophrenia, MEDSCAPE (2016), <http://www.medscape.com/viewarticle/858062>; *see also Mader, supra* note 36.

166. *Id.*

167. *Id.*

168. *See id.*

ptoms.¹⁶⁹ Marijuana use, however, decreases levels of anandamide, which explains why schizophrenics experience worsening symptoms after using marijuana.¹⁷⁰ According to a recent study, “frequent and intense cannabis smoking [reduces] an endogenous protective mechanism, mediated by anandamide, resulting in an increased risk for precipitation of psychosis.”¹⁷¹ These findings make it even more imperative that access to marijuana is restricted for individuals with schizophrenia or at risk of developing the disease.

ii. Marijuana’s Harmful Effects on Antipsychotic Medications

Marijuana use decreases the benefits of antipsychotic medications used to treat schizophrenia.¹⁷² Marijuana may also harmfully interact with these medications, leading to dangerous side effects such as difficulty breathing.¹⁷³ Higher doses of antipsychotic medications cause more side effects and a higher risk of relapse.¹⁷⁴ Physicians generally use two drug classes to help treat schizophrenia. These classes include typical antipsychotic medications, such as haloperidol, chlorpromazine, and perphenazine.¹⁷⁵ There are also atypical antipsychotic medications, such as clozapine, risperidone, and aripiprazole.¹⁷⁶ These antipsychotic medications help treat schizophrenia’s hallucinations and delusions.¹⁷⁷ Marijuana use exacerbates hallucinations and delusions associated with schizophrenia and prevents the medication from helping.¹⁷⁸

Additionally, a person is more likely to experience side effects, such as hypotension, when consuming marijuana and antipsychotic

169. *Id.*

170. *Id.*

171. *Id.*

172. *Cannabis and Prescribed Medications*, NAT’L CANNABIS PREVENTION INFO CTR. (Mar. 19, 2013), <https://ncpic.org.au/professionals/publications/factsheets/cannabis-and-prescribed-medications> [<https://web.archive.org/web/20160319060441/https://ncpic.org.au/professionals/publications/factsheets/cannabis-and-prescribed-medications>].

173. *Drug Interaction Report*, DRUGS.COM, http://www.drugs.com/interactions-check.php?drug_list=2758-0,233-109 (last updated Sept. 2017).

174. Tabea Schoeler et al., *Association Between Continued Cannabis Use and Risk of Relapse in First-Episode Psychosis*, 73 JAMA Psychiatry 1173, 1173 (2016).

175. *Schizophrenia In-Depth Report*, *supra* note 30.

176. *Id.*

177. *Cannabis and Prescribed Medications*, *supra* note 172.

178. *Id.*

medications concurrently.¹⁷⁹ Combining marijuana with antipsychotic medications causes a “moderate interaction” that increases side effects such as dizziness, drowsiness, and difficulty concentrating.¹⁸⁰ Some people also experience impaired thinking and judgment.¹⁸¹ Other effects of combining marijuana and antipsychotic medications include misunderstanding the patient’s mental condition and response to the therapy and an increase in psychosis.¹⁸² A 2003 study in Britain studied rats that were administered haloperidol and injected with marijuana.¹⁸³ The rats exhibited ataxia, catalepsy, and immobility.¹⁸⁴ Although it is uncertain whether these side effects would extend to humans, the study demonstrates that an individual may suffer serious side effects when combining marijuana and antipsychotic medications.

d. Enforcement

The above scientific findings demonstrate that individuals under the age of twenty-five should avoid using marijuana unless cleared by a psychologist. Further, individuals of all ages with proclivities for developing schizophrenia or those already suffering from the disease should avoid using marijuana altogether.¹⁸⁵ These individuals may constitute a minority of prospective marijuana users, but their protection still presents an important government interest. Thus, a jurisdiction contemplating marijuana legalization should implement adequate enforcement measures that would at least partially prevent at-risk individuals from obtaining and using marijuana.

While enforcing laws that restrict certain individuals’ ability to use marijuana will undoubtedly be difficult, such difficulty is no reason to avoid the necessary regulation. After all, the fact that individuals might break the law is no reason to avoid passing it. Perhaps the most effective way to ensure that unauthorized individuals do not access the drug is to require documentation that demonstrates

179. Caroline P. O’Grady & W.J. Wayne Skinner, *A Family Guide to Concurrent Disorders*, CTR. FOR ADDICTION AND MENTAL HEALTH 151 (2007), available at http://www.camh.ca/en/hospital/health_information/a_z_mental_health_and_addiction_information/concurrent_disorders/a_family_guide_to_concurrent_disorders/treatment/Pages/drug_interactions.aspx.

180. *Drug Interaction Report*, *supra* note 173.

181. *Id.*

182. See *Learn About Marijuana*, U. WASH.: ALCOHOL & DRUG ABUSE INST. (2016), <http://learnaboutmarijuanawa.org/factsheets/medications.htm>.

183. Casti et al., *Haloperidol, but not Clozapine, Produces Dramatic Catalepsy in THC-Treated Rats*, 140 BRIT. J. PHARMACOLOGY 520, 520–26 (2003).

184. *Id.*

185. Minkel, *supra* note 148; Szalavitz, *surpa* note 51.

the person is authorized to make the purchase at the cash register, similar to the documentation required to purchase alcohol and tobacco products. When purchasing marijuana, a state could require a person to show documentation that he or she is an eligible purchaser of the drug. Documentation demonstrating eligibility could consist of something as simple as a symbol on a driver's license. The individual could request that symbol when he or she renews the license upon reaching the age of twenty-five or showing adequate proof that a psychologist has cleared him or her to use the drug prior to the age of twenty-five.¹⁸⁶

Critics may argue that the proposed psychological evaluations and the requirement for documentation to purchase marijuana may suffer from a low success rate. For example, critics may point out that similar age restrictions currently exist to prevent youth from obtaining alcohol and tobacco products,¹⁸⁷ but young people frequently do so anyway by simply obtaining these products from people who have authorization to buy these products.¹⁸⁸ Critics may also point out that governments experienced significant problems reducing marijuana use across the nation when the drug was entirely illegal. Curtailing marijuana use in a jurisdiction where the drug is legalized would present even more difficulty.

While difficulties will persist in restricting access to cannabis from unauthorized users of the drug, these approaches would be beneficial in important ways. First, at least some individuals would avoid violating the law to avoid punitive measures.¹⁸⁹ Second, others wishing to comply with the psychological evaluation requirement would receive an evaluation that would lead to the potential diagnosis of

186. The presence or absence of a symbol permitting the purchase of marijuana should not be construed to show that the individual suffers from any type of mental illness. After all, the lack of the symbol can mean many things, including the fact that the person has no intention of smoking marijuana or has chosen not to be evaluated by a psychologist prior to the age of twenty-five. The absence of a symbol would be no less innocuous than the presence or absence of the organ donor symbol on a person's license. *See* Folsom et al., *supra* note 81.

187. *See e.g.*, FLA. STAT. 562.011 (2018); FLA. STAT. 877.112 (2018); ALA. CODE § 6-5-70 (2018); ALA. CODE § 13A-12-3 (2018).

188. *Underage Drinking*, NAT'L. INST. ON ALCOHOL ABUSE AND ALCOHOLISM (Feb. 2017), <https://pubs.niaaa.nih.gov/publications/UnderageDrinking/UnderageFact.htm>.

189. *See, e.g.*, Join Together Staff, *Poll of Teens Finds 77 Percent Say They Don't Drink Alcohol*, PARTNERSHIP FOR DRUG-FREE KIDS (Oct. 24, 2013), <http://www.drugfree.org/news-service/poll-of-teens-finds-77-percent-say-they-dont-drink-alcohol/> (demonstrating that one of the top five reasons that teenagers *avoid* drinking is because of its illegality).

schizophrenia that may otherwise go untreated. This evaluation would advance the government interest of ensuring that citizens who show risk factors for schizophrenia receive early diagnosis and treatment. Finally, while individuals who are diagnosed with schizophrenia could circumvent the law by purchasing marijuana from illegal sources, they would have a strong incentive to avoid such conduct. Their disincentive would result from the conduct's illegality and the information that psychologists would provide to them concerning the dangers of consuming marijuana if diagnosed with schizophrenia. While passing a law and successfully enforcing it remain two very distinct actions, the fact that some individuals may ignore limitations on marijuana use does not reduce the benefits of these limitations to others.

VI. CONCLUSION

Marijuana causes negative effects on the brain that may increase a person's risk of developing schizophrenia. However, legalizing marijuana has potential benefits, such as increasing government revenue, decreasing violence, and providing relief for certain medical conditions. When a state legalizes marijuana, it should develop safeguards to ensure that people under the age of twenty-five cannot obtain the drug. Additionally, state and federal lawmakers should take steps to restrict schizophrenics' access to the drug. Implementing these safeguards will decrease marijuana's negative effects on the development and severity of schizophrenia, and that will improve society.